FIELD OF THE INVENTION

Method of and arrangement for threading of a wrapper web into a nip between drawing rolls in a wrapping device

The invention concerns a method as an apparatus ~~defined in the preamble of claim 1~~ for threading the end of a wrapper web from a wrapper roll into a nip between wrapper proportioning drawing rolls.

~~Further, the invention concerns an arrangement for applying the method.~~

BACKGROUND OF THE INVENTION

Getting a modern wrapping machine and roll wrapping device ready for operation usually requires the input of at least two operators. Using older equipment, getting it ready for operation and changing the wrapper rolls can be even harder. One of the most time-consuming and care-requiring tasks is the threading of the wrapper web from a new roll brought to the wrapping device into the nip between the wrapper proportioning drawing rolls. The wrapper has to remain straight during the feeding and the nip between the drawing rolls has to be closed in such way that both edges of the wrapper are of the same length between the roll and the drawing roll nip. In this way a uniform transverse tension of the wrapper is achieved. Since the positions of the wrapper roll and the drawing roll are invariable with respect to each other, a wrapper that has been positioned askew cannot straighten out in the drawing roll nip, except by wrinkling before the drawing roll nip, and the wrinkle goes through the nip. Further, if the transverse tension of the wrapper ~~isn't~~ is not uniform, the tension of the wrapper that is to be wrapped around a roll will become nonuniform and the wrapping quality will suffer, because a loose wrapper layer will not support the roll sufficiently. A uniform wrapper tension is of particular significance to the quality of the wrapping in the so-called multiple wrapping, where several parallel rounds of wrapper are wrapped around a roll.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a method and apparatus for threading ~~the~~ a wrapper automatically and reliably ~~with a wrapping device~~ from the wrapper roll to the nip between the wrapper proportioning drawing rolls.

~~The invention is based on that a~~ A prepared roll positioned ready for use is rotated against the feeding direction, whereupon the free wrapper end arrives on the

wrapper feeding table and can be ~~indicated.~~ detected. When the wrapper end has been detected, the direction of rotation of the wrapper roll is changed and the wrapper is advantageously fed by blowing air to the nip between the drawing rolls and the nip is closed.

More precisely, the method in accordance with the present invention is characterized in what is presented in the characterizing part of claim 1.

The arrangement in accordace with the present invention is, for its part, characterized in what is presented in the characterizing part of claim 6.

Considerable advantages are achieved by means of the present invention.

The most significant advantage of the invention is that the end of the wrapper can be threaded to the drawing roll nip automatically and very reliably. The wrapper ~~doesn't~~ does not need to be threaded by hand at any stage and the wrapper is always guided by the machine straight forward, whereupon the wrapper arrives straight to the drawing roll nip and its transverse tension will become uniform when the drawing roll nip is closed. ~~Thanks~~ Due to the automatic and reliable guiding the number of possibilities for errors in connection with the changing of wrapper rolls will decrease, by which the quality and reliability of the functioning of the entire wrapping system can be influenced. This makes the work of the wrapping machine operators easier, enabling them to concentrate on the matters that are the most essential ones for the functioning of the system and on the quality control of the rolls that are to be wrapped.

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In the following, the invention will be described in more detail with reference to the figures in the accompanying drawing.

Figure 1 is an illustration of a device in accordance with the invention seen from above,;

Figure 2 is an illustration of a device in accordance with Figure 1 seen from the side,;

Figures 3a - 3c are schematic illustrations of threading of the wrapper end in accordance with the invention.

In Figs. 1 and 2 there are shown ~~members~~ devices for feeding a wrapper from a wrapper roll to wrapper handling members of a wrapping machine. These devices are positioned in connection with wrapping devices, which roll the wrapper around a roll that is to be wrapped. The wrapping device and its support rolls are shown ~~referentially.~~ schematically The rolls that are to be wrapped are brought on a conveyor to a wrapping station and a roll is placed on the support rolls by changing the height between the conveyor and the support rolls, after which the roll is rotated on the support rolls and the wrapper is wrapped around the roll.

With respect to the support rolls, on the opposite side of the wrapping station there is a storage table 1 for storing wrapper rolls 2 of various sizes. In this embodiment there is one pick-up station 26 on the storage table 1 and on both sides of it delivery stations 27. At each station is shown a roll 2, 25. The wrapping station is set up on a frame structure 6 and wrapper proportioners, i.e. a wrapper carriage and a roll in use 3, have been positioned on their one side on rails 7 which are parallel to the roll that is to be wrapped and on their other side on an electric ~~motor-driven~~ motor-driven drive gear 8. The position of the wrapper feeding devices is controlled by an absolute sensor, which is placed on the drive gear shaft. This wrapper roll handling device is intended for the kind of wrapping station applications in which the roll that is to be wrapped can be wrapped in several parallel rounds of wrapper using a wrapper that is narrower than the roll that is to be wrapped. In this kind of device it has to be possible to move the wrapper feeding device in line with the longitudinal axis of the roll that is to be wrapped, in the way that is shown with arrows in Fig.1.

The wrapper proportioners comprise swinging arms 9 for supporting the wrapper material roll 3, below the roll 3 the first part 10 of a wrapper feeding table, in connection with which there are placed conventional drawing rolls 11, 15 for feeding the wrapper and a cross cutting device 5 for cutting the wrapper. The first part 10 of the wrapper feeding table inclines down and at its bottom end after the cross cutting device 5 there is the second part of the feeding table, which continues to the support roll that is on the side of the wrapping station. In the first part 10 of the wrapper

feeding table there are air nozzles 28 for forming a stream of air along the surface of the table 10 downwards and sensors 29 for detecting the wrapper end. After the drawing rolls 11, 15 there is also a sensor 30 for indicating the wrapper end.

The wrapper is fed from the first part 10 of the wrapper feeding table along the second part to the roll that is to be wrapped. The drawing rolls 11, 15 have been placed in such way that the upper edge of the roll 11, which is under the first part 10 of the wrapper feeding table, is approximately on the same level as the table 10 and the roll 15, which is above the table, has been placed to press against the roll 11 below, guided by a cylinder 12. With the cylinder 12 a sufficient pressure is achieved between the rolls 11, 15 for drawing the wrapper and by means of it the nip between the rolls 11, 15 can be opened while the wrapper end is being threaded. The drawing rolls 11, 15 are driven by a motor 21 and the cross cutting device is driven by a motor 22.

The swinging arms 9 have been arranged to swing supported by end plates 13 towards the storage table 1 around a shaft 17. A toothed segment 18 and an electric gear motor 16 equipped with a toothed wheel, which function in connection with each other, have also been attached to the end plate 13. At the opposite end, with respect to the end plate of the other swinging arm 9, there is an electric gear motor 4 for rotating the wrapper roll 3. On the shaft of the gear motor 4 there is a spindle 19, the end of which is conical-shaped. At the end of the opposite arm there is a freely rotating similarly shaped spindle 23. In the ~~centre~~ center of the spindle 19, which is attached to the gear motor 4, there is a mirror 20 and in the ~~centre~~ center of the freely rotating spindle 23 there is a photo cell 24. The spindle arms 9 have been fastened to the end plates 13 through rails 14 in such way that the arms 9 can move regarding the wrapper roll 2.

Collecting a new wrapper roll 2 happens with the device described above as follows. When the wrapper roll 3 used at the wrapping station is finished or when there is too little wrapper left on the roll for a complete wrapping, the old roll or the roll core has to be removed. After this, a new roll is collected. When the old wrapper roll 3 has been removed, the swinging spindle arms 9 are driven to the open-position on the rails 14 and the wrapper carriage is moved to the pick-up station 26 of the new roll 2.

The detectors placed in the carriage indicate the exact place of the roll 2 and that there are no extra rolls in the pick-up area. Next, the spindle arms 9 are turned towards the wrapper roll 2 that is to be collected. The wrapper roll 2 has to be positioned in such way that its ~~centre~~ center hole is on the path of the swinging spindle arms 9. The ~~centre~~ center hole has to be so precisely on the path of the spindles 19, 23 that their conical sections can be pushed into the ~~centre~~ center hole. The spindles have the photo cell - mirror pair 20, 24, which gives a signal when the spindles 19, 23 arrive at the ~~centre~~ center hole. Therefore, using this method, the ~~centre~~ center hole of the roll has to be free and non-plugged so it can be detected. If the ~~centre~~ center hole ~~can't~~ cannot be found, an error message will be given. The spindle arms 9 are now driven on the rails 14 towards the roll 2 and the absolute sensor indicating their movement measures the distance of the spindle arms 9 from the end of the roll 2. When the reading of the absolute sensor indicates that the conical sections of the spindle arms are at least partially in the ~~centre~~ center hole, the brake holding the swinging spindle arms 9 in place in the swinging direction and the brakes affecting the sideways position of the spindle arms are released, whereupon the spindle arms 9 and the spindles 19, 23 position themselves freely with respect to the ~~centre~~ center hole. When the distance detector indicates that the spindle arms are attached to the ends of the roll, the roll can be lifted up to its use station.

If a change of the width or of the quality of the wrapper is desired, the wrapper roll in use has to be lowered away from the use station and a new roll has to be collected to replace it. The changing is done in such way that at first, the wrapper part that is on the feeding table 10 is rolled back ~~aroud~~ around the roll. Then the wrapper carriage is driven to the changing position 27 that has been defined ~~in~~ beforehand and the sensors are used to check whether the area is free. If the changing area is free, the partly used roll is lowered to the changing position. The swinging arms can now be moved to the open-position by moving them away from the roll. Then the spindle arms are lifted and the wrapper carriage is guided to the pick-up station of the new roll. Collecting the new roll happens as described above.

According to the present invention, the wrapper end 31 is threaded to the nip between the drawing rolls 11, 15 in the way that is shown in Figs. 3a - 3c. The roll 3, which has been collected to the use station as described above, has been prepared,

i.e. its pacsupport has been removed and the wrapper end 31 has been released and cut in the specified shape. When the wrapper roll 3 has been lifted to the use station, the end 31 hangs down from the roll 3 as shown in Fig. 3a on the opposite side of the wrapper roll 3 with respect to the wrapper feeding table 10. Now, the roll 3 is rotated according to the arrows in Fig. 3a ~~against~~ against the wrapper feeding direction, whereupon the wrapper end 31 goes ~~round~~ around the roll 3 and falls on the wrapper feeding desk 10 as shown in Fig. 3b. At the same time as the roll is being rotated air is blown from the air nozzles 28 along the surface of the feeding table 10 and the stream of air moving on the surface of the table sucks the wrapper end 31 against the table. Thus the wrapper end 31 is detected by the sensor 29 and the wrapper roll 3 is stopped and its direction of rotation is changed to the direction of rotation of the wrapper in accordance with the arrow in Fig. 3c. Now the rotating motion of the roll 3 feeds the wrapper along the feeding table 10 and the air blown from the air nozzles 28 feeds the wrapper forward and keeps the wrapper on the surface of the table 10 and straight. When the wrapper end passes the drawing rolls 11, 15, it is detected by the sensor 30 and the nip between the drawing rolls 11, 15, which has been open, can be closed. The wrapper has now been threaded in its place and the wrapping station is ready for operation.

It is understood that the present invention is also suitable for other types of wrapping stations besides the one described above. The method is suitable e.g. for the kind of wrapping stations that have several stations for wrapper rolls. The types and positions of the sensors and air nozzles in the wrapper feeding table can vary according to the structure of the wrapping station that is used. Air ~~doesn't~~ does not have to be blown continually during the reverse rotating motion of the wrapper roll, but if the blowing is started before the wrapper end comes to the wrapper feeding table, it is more certain that it will be detected. It is also conceivable that with some wrapper qualities the air blowing is not used at all, but in that case the wrapper has to be slack enough to fall straight on the wrapper feeding table and yet stiff longitudinally so it can be fed by the rotating motion of the roll.

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